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ABSTRACT

Learning objectives for the non-college preparatory mathematics program of the Grossmont Union High School District (California) and a description of the competency-based comprehensive mathematics program of Helix High School (Grossmont School District) are presented. An introduction to the Grossmont program objectives outlines the purpose and format of the objectives list. The objectives describe mathematics skills which are considered desirable for graduating students. One hundred sixteen objectives are organized into 20 categories, each of which contains between two and 12 objectives. The categories include basic operations, fractions, estimation, computation of interest, word problems, graphs, measurement, metrics, algebraic relationships, personal money management, statistics, calculators, and computers. A glossary of mathematics terms is included. The description of the Helix High School mathematics program, an accountability-based program which requires adequate understanding of course material before advancement to the next course, includes: (1) background on program development; (2) student placement considerations; (3) statistics on the number of students taking mathematics courses; (4) a description of the counseling program conducted by mathematics teachers; and (5) statistics on the improvement in student achievement resulting from the program. A matrix which relates the Grossmont program objectives to the Helix High School mathematics courses is included. (DC)

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PROGRAM OBJECTIVES

FOR

NON-COLLEGE PREPARATORY MATHEMATICS

[and]

The Comprehensive Math Program: Helix High School.

Introduction to

"Program Objectives for Non-College Preparatory Mathematics"

I. Purpose

This booklet contains objectives desired for the mathematical background of all students who graduate from the Grossmont District. It is not designed to be all-inclusive. Teachers of particular classes will undoubtedly have additional objectives for their students.

There is no one course that could encompass all objectives listed in this publication. However, it is considered desirable for students to have exposure to all objectives. Students are expected to demonstrate competency in particular objectives before graduation.

II. Objective Description

Each objective includes:

(1) What the student is to do and
(2) How the student is to demonstrate this knowledge.

III. Glossary and Letter Notations

(1) The Glossary has been designed to enable individuals other than math teachers to interpret words or phrases which may be unfamiliar. Certain definitions may not be as rigorous as those found in a math dictionary.

(2) The Roman numeral I or II preceding some objectives indicates the use of that particular objective in the Level I and Level II tests required for graduation. All behavior will be demonstrated through the use of paper and pencil.

IV. Revisions

The objectives in this booklet are not considered part of a static document. Additions, deletions, and modifications to this material will take place as deemed necessary by the District Math Council.

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1.0 BASIC OPERATIONS WITH WHOLE NUMBERS, ORAL AND WRITTEN

1.1 Each student will be able to perform basic addition, orally, utilizing addends from zero to nine.

1.2 Each student will be able to perform basic subtraction, orally, using numbers resulting in non-negative differences from zero to nine.

1.3 Each student will be able to perform basic multiplication, orally, using factors from zero to nine.

1.4 Each student will be able to answer orally, division problems resulting in whole number quotients, where divisors and quotients are numbers from zero to nine.

1.5 Each student will be able to solve addition problems with two to six addends of one to seven digits each.

1.6 Each student will be able to solve subtraction problems using numbers of one to seven digits each.

1.7 Each student will be able to perform multiplication of a one to seven digit number by a one to three digit number.

1.8 Each student will be able to perform long division of a two to seven digit number by a one to three digit number where the dividend is greater than the divisor, showing remainder, if any, as a fraction.

2.0 BASIC OPERATIONS WITH COMMON FRACTIONS, RATIO, AND PROPORTION

2.1 Each student will be able to reduce a proper fraction to its lowest terms, where the numerator is no greater than two digits and the denominator is no greater than three digits.

2.2 Each student will be able to perform addition of fractions with like denominators, expressing the sum in lowest terms.

2.3 Each student will be able to perform addition of fractions with unlike denominators of multiples of 2, 3, and 5, expressing the sum in lowest terms. Denominators will not exceed two digits in length.

2.4 Each student will be able to perform subtraction of fractions with like denominators, expressing the difference in lowest terms.

2.5 Each student will be able to perform subtraction of fractions or subtraction of fractions and whole numbers, with unlike denominators with multiples of 2, 3, and 5, expressing the difference in lowest terms. Denominators will not exceed two digits in length and whole numbers no less than 10.

I 2.6 Each student will be able to convert mixed numbers into equivalent improper fractions.

I 2.7 Each student will be able to perform multiplication involving proper fractions and/or mixed numbers, expressing the product in lowest terms.

I 2.8 Each student will be able to perform division involving proper fractions and/or mixed numbers, expressing the quotient in lowest terms.

II 2.9 Each student will be able to compare two numbers by forming a ratio.

II 2.10 Each student will be able to use means-extremes product property of a proportion.

II 2.11 Each student will be able to solve for the unknown in a proportion consisting of three numerical terms and an unknown.

3.0 BASIC OPERATIONS WITH DECIMAL NUMBERS, PLACE VALUE, AND READING OF WHOLE NUMBERS AND DECIMALS

I 3.1 Each student will be able to state the place value of the individual digits of a decimal number from billions to ten-thousandths.

I 3.2 Each student will be able to read decimal numbers as large as billions and as small as ten-thousandths.

I 3.3 Each student will be able to add as many as five decimal numbers having up to six digits.

I 3.4 Each student will be able to subtract up to six-digit decimal numbers; at least 60% of such subtractions to include borrowing.

I 3.5 Each student will be able to multiply decimal numbers with a multiplier maximum of three digits and a multiplicand maximum of five digits.

I 3.6 Each student will be able to divide decimal numbers by one- to three-digit whole numbers where the answer is exact.

I 3.7 Each student will be able to divide decimal numbers by one- to three-digit decimal fractions where the answer is exact.

3.8 Each student will be able to round off a given three-digit number to the nearest hundred.

3.9 Each student will be able to round off a given integer of more than three digits to fewer digits.

3.10 Each student will be able to round off a given rational number in decimal form with a five-digit fractional part to fewer digits.

II 3.11 Each student will be able to divide, finding answers correct to the nearest tenth, hundredth, or thousandth as specified, decimal number division problems having divisors with one to three digits.

4.0 COMMON FRACTION, DECIMAL FRACTION, AND PER CENT CONVERSIONS

I 4.1 Each student will be able to convert a common fraction, with numerator and denominator of one to three digits, into a decimal fraction correct to the nearest hundredth. Common fractions must include representative samples having one hundred as the denominator.

I 4.2 Each student will be able to convert a common fraction with numerator and denominator of one to three digits into a percent. Common fractions must include those having one hundred as the denominator.

I 4.3 Each student will be able to convert a decimal fraction as small as one hundredth to a common fraction.

I 4.4 Each student will be able to convert a decimal fraction as small as one hundredth into a percent.

I 4.5 Each student will be able to convert a percent into a decimal fraction. Percents must include some of the commonly used ones such as: 50% 25%, 10%.

I 4.6 Each student will be able to convert a percent into a common fraction. Percents must include some of the commonly used ones such as: 50%, 25%, 10%.

5.0 WORKING WITH PER CENTS, PERCENTAGES, AND DISCOUNTS

II 5.1 Each student will be able to find a specified per cent of a whole number, mixed decimal number, or decimal fraction.

II 5.2 Each student will be able to determine what per cent one whole number or decimal number is of another whole number or decimai number.

5.3 Each student will be able to calculate the unknown number in a given specified percentage of a number such as: "78 is 36% of what number?"

II 5.4 Each student will be able to find the amount of discount and the net price from an original selling price and a discount rate stated as a common fraction or a per cent.

6.0 ESTIMATING ANSWERS

6.1 Each student will be able to estimate the answer to a whole number or decimal number multiplication problem to, at most, two significant digits.

6.2 Each student will be able to estimate the answer to a whole number or decimal number division problem to, at most, two significant digits.

6.3 Each student will be able to estimate the answer to a multiplication or a division problem involving mixed numbers to, at most, two significant digits.

6.4 Each student will be able to select a result which is reasonable given a problem and a set of results.

7.0 SIMPLE AND COMPOUND INTEREST

II 7.1 Each student will be able to compute interest using the simple interest formula $I = PRT$.

II 7.2 Each student will be able to compute an amount using the formula $A = P + I$.

7.3 Each student will be able to compute interest, compounded, over 2 to 4 periods, given the rate, principal, and compounding periods.

8.0 INTERPRETING AND SOLVING WORD PROBLEMS

8.1 Each student will be able to identify and state what is being asked for, given a basic word problem involving either weight, measure, distance, rate, time, area, volume, interest, or per cent.

8.2 Each student will be able to identify the method of solution, given a basic word problem involving either weight, measure, distance, rate, time, area, volume, interest, or per cent.

II 8.3 Each student will be able to solve a basic word problem involving either weight, measure, distance, rate, time, area, volume, interest, or per cent using basic arithmetic skills.

9.0 INTERPRETING SCALE DRAWINGS, INTERPRETING AND CONSTRUCTING GRAPHS

9.1 Each student will be able to calculate the actual length of specified parts by reference to a scaled drawing's legend.

II 9.2 Each student will be able to select from a given portion of a highway road map, the most direct route between two cities and compute the distance.

II 9.3 Each student will be able to interpret bar graphs, line graphs, and circle graphs.

9.4 Each student will be able to construct bar graphs, line graphs, and circle graphs from a given set of data to a degree of accuracy appropriate to the situation.

9.5 Each student will be able to distinguish between continuous data and discrete data.

10.0 LINEAR MEASUREMENT AND CONVERSION IN THE ENGLISH SYSTEM

II 10.1 Each student will be able to measure items or distances up to three times the length of the measuring instrument, to the nearest one-fourth inch, using a measuring tape or ruler graduated in eighth inches.

10.2 Each student will be able to measure the length and width of a classroom using a fifty-foot tape, and compute the floor area accurate to the nearest square foot.

II 10.3 Each student will be able to convert a distance measurement in feet to a measure in yards or inches.

11.0 LENGTH, VOLUME, AND WEIGHT MEASUREMENT IN THE METRIC SYSTEM

II 11.1 Each student will be able to measure lengths in meters, centimeters, and millimeters to the nearest unit specified.

11.2 Each student will be able to select the correct volume, stated in metric units, appropriate to a given object.

11.3 Each student will be able to select the correct weight, stated in metric units, appropriate to a given object.

12.0 METRIC UNITS AND ENGLISH-METRIC CONVERSION

II 12.1 Each student will be able to recognize the meaning of the six common metric prefixes: milli, centi, deci, deka, hecto, and kilo.

II 12.2 Each student will be able to recognize the standard abbreviations and the meanings of the six common metric prefixes when used in conjunction with the three basic metric units: meter, liter, and gram.

II 12.3 Each student will be able to convert any metric measure involving the three basic metric units and the six common metric prefixes into larger or smaller units.

12.4 Each student will be able to convert a metric measure into an equivalent English measure, accurate to the nearest tenth of a unit, using a metric-to-English conversion table.

12.5 Each student will be able to convert an English measure into an equivalent metric measure, accurate to the nearest tenth of a unit, using an English-to-metric conversion table.

13.0 IDENTIFYING BASIC GEOMETRIC CONCEPTS AND COMPUTING PERIMETERS, CIRCUMFERENCES, AREAS, AND VOLUMES

II 13.1 Each student will be able to identify examples of the basic geometric concepts of line, plane, parallel, and perpendicular.

II 13.2 Each student will be able to identify geometric solids such as cube, cylinder, rectangular solid, sphere, and pyramid given the pictorial representation of the solid.

13.3 Each student will be able to determine the perimeter of polygons, given appropriate dimensions.

13.4 Each student will be able to measure the appropriate dimensions of a given figure which is rectangular or triangular, and find its perimeter.

13.5 Each student will be able to select from a list of formulas associated with circles, a correct formula; and find the circumference of a circle, given either the diameter or the radius.

13.6 Each student will be able to measure the appropriate dimension of a circular figure and find the circumference to the nearest half-inch.

13.7 Each student will be able to select from a list of formulas associated with areas of polygons, a correct formula; and find the area of a rectangle, parallelogram, trapezoid, or triangle, given the appropriate dimensions.

13.8 Each student will be able to select from a list of formulas associated with circles, a correct formula; and find the area of a circle, given either the diameter or the radius.

13.9 Each student will be able to measure the appropriate dimension of a given figure which is rectangular, triangular, or circular, and find the area to the nearest square inch.

13.10 Each student will be able to select from a list of formulas associated with volumes of solids, a correct formula; and find the volume of a rectangular solid, given the appropriate dimensions.

13.11 Each student will be able to select from a list of formulas associated with volumes of solids, a correct formula; and find the volume of a right circular cylinder, given the appropriate dimensions.

14.0 OPERATIONS WITH WEIGHT, VOLUME, LENGTH, AND TIME MEASUREMENTS

II 14.1 Each student will be able to find sums or differences of given measures of like units of weight, volume, length, or time, accurate to the smallest unit of measure.

II 14.2 Each student will be able to express the given sum or difference of two measures of weight, volume, length, or time, in the correct combination of units.

II 14.3 Each student will be able to multiply a given measure of weight, volume, length, or time by a whole number and write the product in the correct combination of units.

15.0 FUEL CONSUMPTION AND THE DISTANCE FORMULA

II 15.1 Each student will be able to calculate fuel consumption in miles per gallon, given distance or rate and time, and the amount of fuel consumed.

II 15.2 Each student will calculate the number of gallons of fuel required, given fuel consumption in miles per gallon, and total distance or time and rate.

16.0 BASIC ALGEBRAIC REALTIONSHIPS

16.1 Each student will be able to recognize order relationships among coordinates of a number line.

16.2 Each student will be able to recognize order relationships among several rational numbers in fraction form.

16.3 Each student will be able to change repeated multiplication involving whole numbers to positive exponential form.

16.4 Each student will be able to change a number in positive exponential form to a repeated multiplication form.

16.5 Each student will be able to add two signed numbers which result in either a positive or a negative sum.

16.6 Each student will be able to subtract two signed numbers which result in either a positive or a negative difference.

17.0 PERSONAL BUSINESS

II 17.1 Each student will be able to specify the correct change using any combination of currency or coin up to twenty dollars.

II 17.2 Each student will be able to balance the checkbook to the nearest dollar, given a sample bank statement with cancelled checks, a sample check record, and deposit receipts.

17.3 Each student will be able to establish a budget specifying total revenue available, total expenses, and expected balance at the end of the month, given a monthly beginning balance and a list of expected income and expenses.

II 17.4 Each student will be able to interpret a credit card statement by identifying the amount of previous balance, additional purchases, interest charges on previous balance, current balance, and minimum payment due.

II 17.5 Each student will be able to check calculations on a credit card statement such as carrying charges, crediting of payments, and addition of new purchases.

II 17.6 Each student will be able to calculate the amount of tax or refund, given a sample 1040A income tax form, appropriate sample data that has been entered on the form, and a tax table.

18.0 STATISTICS: AVERAGES AND PROBABILITY

II 18.1 Each student will be able to find the mean of a set, given a set of data of up to twenty elements.

II 18.2 Each student will be able to arrange the elements in rank order, and find the median of the set, given a set of data of up to twenty elements.

18.3 Each student will be able to calculate the probability that an event will occur.

18.4 Each student will be able to calculate the probability of the complement of an event.

19.0 BASIC CHARACTERISTICS AND USES OF THE CALCULATOR; COMPUTER AWARENESS

19.1 Each student will be able to recognize the basic characteristics of a calculator which enable it to do its job.

19.2 Each student will be able to identify which functions are common to all calculators.

19.3 Each student will be able to name desirable characteristics of a calculator such as: memory, overflow indicator, clear entry key, floating decimal point, antislip feet, A.C. adaptor, rechargeable, low charge warning indicator, desirable readout characteristics, guarantees and servicing, durability of construction.

19.4 Each student will be able to recognize characteristics of the calculator which make it different from a computer.

19.5 Each student will be able to identify the basis upon which a correct answer will depend, such as: accurately entered data; use of functions in correct order; sufficient power to operate.

19.6 Each student will be able to identify the various categories of calculators on the market based on their characteristics and applicability, such as: desk top or hand-held calculator; answer loss and answer retention calculator; business, scientific, and home use calculator; programmable and non-programmable calculator.

19.7 Each student will be able to recognize the 13 basic keys of a calculator: +, -, x, ÷, =, +/-, C, CE, MC, M+, M-, MR, (.).

19.8 Each student will be able to recognize the fact that using the memory of a calculator reduces the number of calculations.

19.9 Each student will be able to list the proper sequencing of functions which will reduce the number of partial answers recorded on paper.

19.10 Each student will be able to use a calculator to help make optimal choices in real life situations.

19.11 Each student will be able to name uses of a calculator in real life situations such as: balancing a checkbook; keeping a running balance in purchasing; checking a credit card statement; determining sales tax and total cost of a purchase; preparing State or Federal income tax returns.

19.12 Each student will be able to answer basic questions as to the nature and use of computers.

20.0 READING TABLES

20.1 Each student will be able to recognize that the general structure of all tables is essentially a visual picture of a set of ordered pairs.

20.2 Each student will be able to recognize the purpose of a particular table by reading the descriptive phrases.

II 20.3 Each student will be able to enter the body of a table from its parameters and read information in the body of the table.

II 20.4 Each student will be able to enter the body of a table directly and read the parameters.

20.5 Each student will be able to recognize the basic approach to simple interpolation.

20.6 Each student will be able to recognize that extrapolation means the ability to guess values of a variable beyond those given in a table.

GLOSSARY

addend	one of a set of numbers to be added
amount (A)	the sum of the principal and interest
answer-loss calculator	a calculator which produces only a visual (vacuum flourescent) display
answer-retention calculator	a calculator which produces a permanent record (paper tape printout) of calculations
approximate number	a number which is nearly but not exactly the same as the given number
area	the number of square units contained in a plane figure
basic operations	addition, subtraction, multiplication, and division
body of a table	the systematic listing of entries in columns and/or rows (the number of variables or parameters -- see also "table" and "parameters")
calculator	a machine for doing rapid addition, subtraction, multiplication, and division (some calculators perform additional functions such as taking square roots, finding logarithms, and trigonometric functions, etc.)
calculator functions	operations performed by calculators such as adding, taking square roots, finding logarithms of numbers, etc.
circumference	the distance around a circle
common fraction	a fraction with a numerator and a denominator which are both positive integers
complement of an event	the probability that an event will not occur (see also "probability")
computer	an electronic machine which performs rapid, often complex calculations by means of programmable stored instructions
continuous data	an uninterrupted series of data with no distinct parts (see also "discrete data")
coordinates	a number which is associated with a point
correct combination of units	a measurement of length, volume, weight, or time expressed so that the maximum integral number of largest units is first expressed, followed by the maximum integral number of the next largest unit, and so on

decimal fraction	a proper fraction whose denominator (not written) is a power of 10, the power being the number of digits on the right hand side of the decimal point, as 0.05 or 0.23
decimal number	any number from the set of numbers with base ten
denominator	the number below the line in a common fraction
diameter	any straight line passing through the center of a circle whose end points lie on the circle
difference	the result of a subtraction problem (sometimes called the remainder)
digit	a term applied to any of the integers 0 through 9; such as, the number 23 has digits 2 and 3
dimension	refers to those properties called length, area, and volume
discrete data	separate and distinct data made up of distinct parts (see also "continuous data")
distance formula	distance is equal to rate times time (D = RT)
dividend	the number which is to be divided
divisor	the number which does the dividing $\text{divisor} \overline{)\ \text{dividend}}^{\ \text{quotient}}$
English measure	a system of measures, often called the British-American system, in which length is measured in inches, feet, yard, etc.
equivalent fractions	different names for the same fraction (3/6 and 4/8 are equivalent fractions)
event	an outcome whose probability can be obtained from consideration of a single occurrence; the tossing of a coin for heads (or tails) is an event
exponential form	a symbolic method of representing repeated multiplications; such as 6^4 means 6 used as a factor 4 times
extremes	the first and last terms in a proportion
factors	if two or more values are multiplied together to yield a product, each of those values is called a factor of the product

formula	a general rule or principle stated in mathematical language
improper fractions	a common fraction whose numerator is larger than (or equal to) the denominator
integer	any of the positive numbers (1, 2, 3, etc.), zero, and the negative numbers (-1, -2, -3, etc.)
interest (I)	money paid for the use of money
interpolation	the process of finding a value of a function between two known values by a process different from that which yielded the two known values
mean (average)	the quotient of the sum of a group of numbers divided by the number of members in the group
means	the second and third terms in a proportion

metric prefixes

milli -	1/1000	or	.001
centi -	1/100	or	.01
deci -	1/10	or	.1
deka -	10		
hecto -	100		
kilo -	1000		

metric units

meter	basic unit of length; approximately 39.37 inches
liter	basic unit of liquid volume; approximately 1.06 quarts
gram	basic unit of weight. The kilogram is 1,000 grams; approximately 2.2 pounds

mixed number	sum of a whole number and a common fraction
mixed decimal number	sum of a whole number and a decimal fraction
multiples	a number which is the product of a given integer and another integer; 12 is a multiple of 2, 3, 4, 6; also 0, 3, 6, 9, etc. are called multiples of 3
multiplicand	the number which is to be multiplied
multiplier	the number which does the multiplying

$$\begin{array}{rl} & \text{multiplicand} \\ \times & \text{multiplier} \\ \hline & \text{product} \end{array}$$

non-negative numbers	zero and all positive numbers

non-programmable calculator	a calculator which is not programmable (see "programmable calculator")
numerator	the number above the line in a common fraction
ordered pairs	a pair of numbers, usually written (2, 3), in which the order of the digits has significance; if (2, 3) represents the fraction 2/3, then (3, 2) represents 3/2
ordered relationships	the relationship which makes it possible to tell whether one of two numbers precedes, equals, or follows the other
parameters	constants or variables which distinguish various specific cases (when referring to tables, the parameters are the variables used to enter the body of the table)
per cent	a ratio that can be named by a fraction with a denominator of 100
percentage	the product obtained by multiplying a number by a per cent (in the problem 6% of 200 is 12, 12 is called the percentage
perimeter	the sum of the length of the sides of a polygon or the distance around a closed curve
polygon	a closed plane figure of 3 or more sides (triangle, quadrilateral, pentagon, etc.)
principal (P)	the amount of money loaned or borrowed
probability	the chance that one of two or more possible outcomes will occur
product	the result of a multiplication problem
programmable calculator	a calculator which has the ability to accept an external program (a sequence of steps to solve a problem) which is different than those programs inherent to the calculator itself
proper fraction	a common fraction whose numerator is smaller than the denominator
proportion	a mathematical statement equating two ratios
quotient	the result of a division problem

radius	the distance from the center of a circle to a point on the circle
rate (R)	in interest problems, the per cent is called the rate; in distance problems, the speed is called the rate
ratio	the comparison of two whole numbers by division
rational number	a number that can be expressed as an integer or as a quotient of integers (fraction)
remainder	when a divisor does not divide into a dividend an integral number of times, the difference between the dividend and the product of the divisor and the quotient is called the remainder
repeated multiplication	a number such as 6 x 6 x 6 x 6 (see also "exponential form")
round off	to drop digits after a certain significant place; such as, rounding off to the nearest hundredth (see also "approximate number" and "significant digits")
scale drawing	a drawing of something with all distances multiplied by a constant factor, as in an architect's drawing of a house plan; distances in feet are denoted by inches or fractions of inches
signed numbers	positive and negative numbers
significant digits	the digits of a number, beginning with the first nonzero digit on the left of the decimal point, or with the first digit after the decimal point if there is no nonzero digit to the left of the decimal point, and ending with the last digit to the right
sum	the result in an addition problem
table	a systematic listing of results already worked out (see also "body of table" and "parameters")
tax form	Form 1040A (U.S. Individual Income Tax Return), used for reporting annual income and the amount of tax due
time (T)	in the interest formula, I = PRT, time is expressed in years

unknown	that which is represented by a symbol which represents an element of a specified set
volume	a number which describes the number of cubic units contained in a solid
whole numbers	non-negative integers (0, 1, 2, 3, etc.)

THE COMPREHENSIVE MATH PROGRAM

HELIX HIGH SCHOOL

This paper is a brief description of a comprehensive math program which has been used with great success at Helix High School. In examining this material the reader should understand that a complete analysis of the procedures would require a great deal more material than is provided here.

The program consists of four parts: 1) proper placement and student accountability, 2) proper materials, 3) adequate class time, and 4) mathematics programming. Each of these aspects is described briefly in the following narrative along with a history of the development of the plan itself.

In the spring of 1972, during a meeting of our math department, we discussed at length a problem which we, as individual teachers, had been slowly recognizing the past few years: 1) a number of our students were moving from one class to the next without really knowing the math material, and 2) many were graduating without an adequate background in math. The recognition of these two problems led to the development of the "Comprehensive Math Program."

First, we decided students must be placed in their ninth grade classes according to their mastery of elementary arithmetic. We developed and gave a test to all incoming ninth grade students in the spring of their eighth grade year. We entered those students who did not show satisfactory achievement in one of two classes: students with a good attitude towards learning were entered in Basic Arithmetic, those with ability but poor attitudes were entered

into Arithmetic Review. Students who did well on the exam were placed in Applied Arts, College Prep or Accelerated Math sequences as their interests and abilities indicated.

Students in Basic Arithmetic were given credit towards their one-year District math requirement; students in Arithmetic Review were not. If a student did not master the basic skills in Arithmetic Review by the end of the first semester, he had to repeat the course until it was accomplished.

At the beginning of the ninth year all students were retested during their first two days at Helix to ensure proper placement. The first year of the program saw the establishment of seven Arithmetic Review classes. At the beginning of the second semester the number had dropped to three.

The students in these three classes had been told for years that a lack of learning would result in the repeating of a class. Of course, this had never actually happened. Needless to say, they were shocked when they discovered the start of the second semester found them once again in Arithmetic Review.

The beginning of the second year we still had one section of Arithmetic Review for the tenth grade class. By the end of the third semester all but three of the students had passed. These same procedures have also been used in all higher level math courses. A student must demonstrate adequate understanding of the material before he is advanced to the next course.

The second phase of the program was the preparing of materials which would adequately provide a coverage of the math objectives we felt were necessary. Along with several other schools in our district, we developed a list of 118 math objectives which would give our graduating students an

excellent background in math. We then prepared a matrix of courses and objectives to ensure that all objectives would be adequately covered by all students before graduation. (Please note enclosed matrix.)

The areas of mathematics which we felt were not adequately covered by the current texts were the Applied Arts and Remedial Math sequences. Consequently, we wrote all of the materials for the seven different courses which we now have in these two areas.

While the work of preparing course objectives and new materials was going on, we held several meetings with the counseling and administration staffs. Both groups gave immediate recognition to the importance of the program and gave their complete support. They recognized the importance of adequate time in math courses and counselors started to increase course time for all students.

Today, in a school of 2170 students, 1830 (84%) are taking a math course. Essentially all of our ninth and tenth grade students take math; 80% of our juniors and 50% of our seniors also take math courses.

After students had completed their first two years in school we administered a two-hour test covering all of the objectives in the matrix. Students who did not pass this examination were programmed into additional math courses.

Today, because of the district adopting our program with the consequent different requirements for some schools, the new State requirement for testing, and our own learning experiences, some modifications have been made to this major part of our original program. Essentially, however, it remains as it has been described in these pages.

A few years after the beginning of the program, it was recognized that math teachers needed to be more involved in the decisions a student must make regarding his future math courses. Consequently, the last phase of our program, the "Math Teacher as a Counselor," was developed.

At the beginning of the second semester, just before the start of programming for the next year, every math teacher discusses a prepared package of math counseling material with his classes. Such items as the following are included: 1) a local Chamber of Commerce survey of employers about their requirements for employees, 2) a survey of Applied Arts graduates about the courses they really needed to take in high school for their jobs, 3) a survey of College Prep graduates about the courses they really needed to take in high school for college preparation, 4) articles on women and math anxiety, and 5) a listing of all possible programs in the colleges and universities of the State and the math requirements for each.

After discussion we distribute a form where each student lists his vocational goal(s), if any, and the math course he plans to take next year. Each teacher examines this information and counsels with each student whose choice seems inappropriate in terms of vocational goals and math abilities. A follow-up system is provided to ensure the student take the program he indicated.

The question which now must be answered is, "What has this program achieved?" The following achievements speak for themselves: 1) 84% of the student body is taking a math class, 2) math classes overall consist

of 48% girls. The higher math classes of Algebra II, Pre-calculus and Calculus are 45% girls, 3) the most recent parent survey shows 88% satisfied and 3% not satisfied with the Helix program, 4) our graduating class of 1983 came into school the second lowest of the nine schools in our district (H.P.A.) and graduated the tops (C.A.P.), 5) our S.A.T. scores have averaged 55 points (523) above the national norms the past eight years (1976-83), and 6) our California Assessment Program (C.A.P.) scores have ranged from the 92nd to the 95th percentile over the last six years.

Probably the real strength of the program lies in the demonstration that clever solutions are not necessary to good math education. Rather our experience would indicate the answer lies in the combination of the following: 1) high standards and our insistence that students meet them, 2) a well trained professional staff willing to do the work, and 3) solid support from administrators, counselors, and parents.

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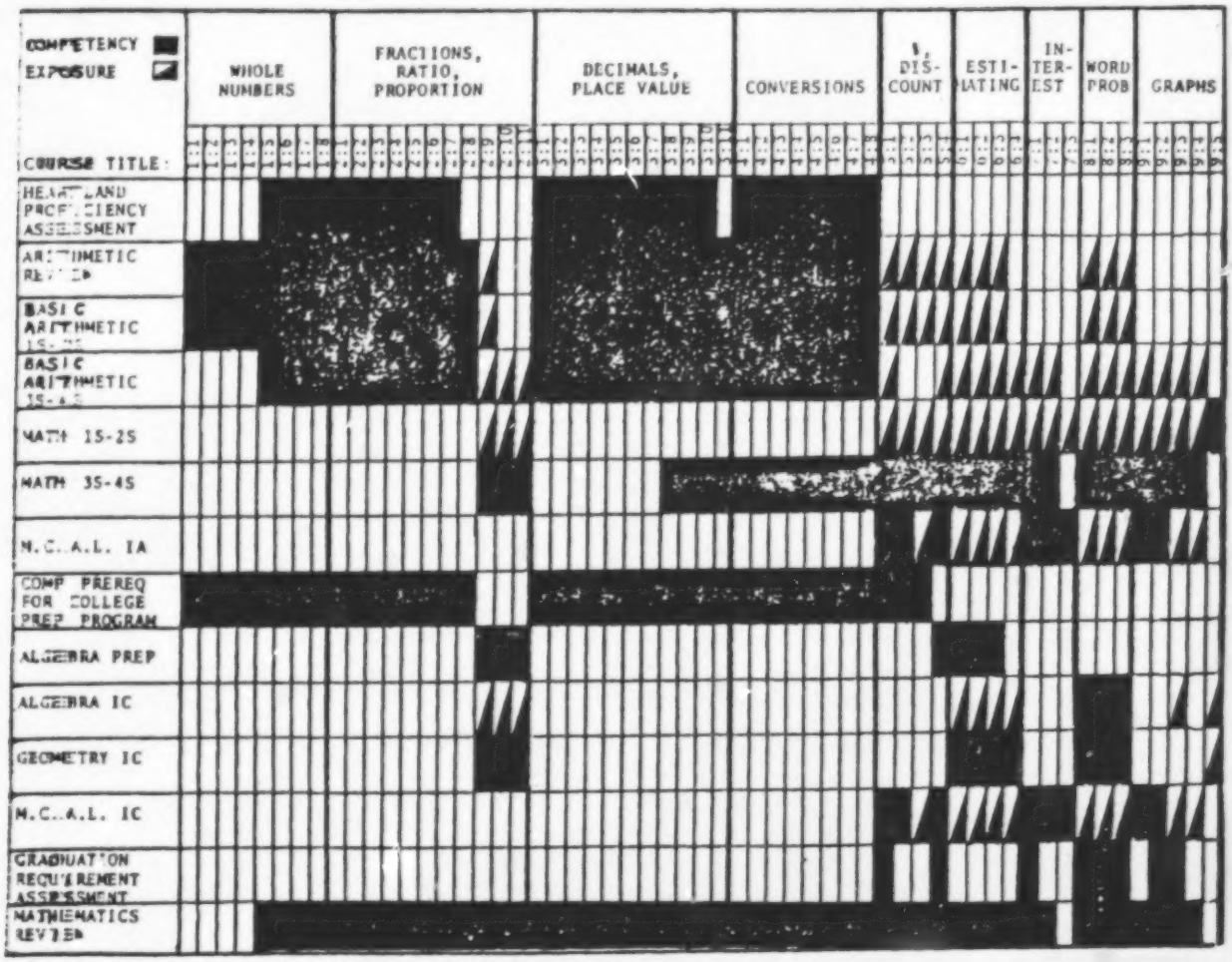
COVERAGE OF GROSSMONT DISTRICT MATH OBJECTIVES BY COURSE SEQUENCE
HELIX HIGH SCHOOL



*Objectives continued on next page.

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